



**Southern California Repeater and  
Remote Base Association  
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## In the Matter Of:

# Proposed changes to the Amateur Service Rules (Part 97) to facilitate additional uses of certain portions of amateur spectrum by Amateur Spread Spectrum emitters

**RM-8737**

DOCKET FILE COPY ORIGINAL

**Re: Comments of the Southern California Repeater and Remote Base Association in opposition to portions of the Petition for Rulemaking by the American Radio Relay League which proposes to “facilitate” more Amateur Spread Spectrum uses.**

**February 23, 1996**

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## SCRRBA

### SUMMARY

SCRRBA believes that this petition should be summarily dismissed without action. We find the following defects in the petition:

- 1: The petition is based upon inference and supposition, not scientifically collected and reported DATA.
- 2: SCRRBA finds this petition to be inadequate, incomplete and wholly without technical supporting data.
- 3: Both the petition and the letter of “information” from the STA holder are wholly without supporting technical data.
- 4: The petitioner does not show how incumbent band users will be protected from new interference.
- 5: The petitioner does not show how band segments can be established for SS communications.
- 6: The petitioner is unclear on interference potentials, or methods of resolving interference.
- 7: The petitioner does not take notice of and incorporate the use of community based band usage plans or frequency coordinators both of which exist in every state in the union.
- 8: The petitioner does not provide a meaningful and uniform method of SS station identification.
- 9: The petitioner omits a description of SS emissions with necessary attendant definitions and discussion.

Should the Commission choose to act upon any or all of this petition, SCRRBA has incorporated within our following comments various corrections and changes to the proposed rules. These changes clarify certain areas of confusion, and add missing information and methods.

## SCRRBA

### Introduction

The Southern California Repeater and Remote Base Association (SCRRBA) is a voluntary association of owners and operators of Amateur Radio Service fixed and mobile relay stations operating primarily on the UHF and Microwave Frequency amateur bands. SCRRBA has provided frequency coordination for these activities since 1970. SCRRBA is the recognized frequency coordinator for the Southern California region for the amateur 29 MHz, 50 MHz, and 420 MHz and above bands.<sup>1</sup> SCRRBA has actively participated in numerous Federal Communications Commission rule making proceedings pertinent to our activities.

SCRRBA currently maintains over 2,100 frequency coordination records. These data represent the activities of approximately 600 relay type amateur radio systems in Southern California. All of these systems operate on the UHF (420 MHz) and higher amateur frequency bands. These systems each have an average membership of about 60 amateurs. The largest of these systems has a membership exceeding 1,400.

SCRRBA is an active participant (usually the sponsor) in the amateur band planning process. We represent the fixed and mobile relay interests in regional band planning meetings. These meetings occur when the existing plans do not cover a desired activity, or when they need to be upgraded to match new or increased activities. These meetings are attended by representatives of ALL the amateur uses of the band. These band plans are adopted by unanimous consent of these representatives. These band plans cover activity in the Southern California region. Whenever the community adopts a new band plan for our region, we submit it to the American Radio Relay League, Inc. (ARRL) to be included in national band planning efforts.

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<sup>1</sup> Please see any issue of the ARRL Repeater Directory. This Directory lists the recognized frequency coordinators throughout the nation. Please also note that this directory lists ONLY activity suitable for "itinerant" mobile use and as such is NOT a suitable list of ALL the activity occurring within an amateur band.

**Discussion:**

The instant petition appears, on its surface, to merely be a request to simplify and relax the existing rules governing Amateur Spread Spectrum (SS) operations. Such changes to the rules are generally desirable when there are no significant side effects. Unfortunately, this petition is not well thought out. We will show in the following paragraphs that this petition is seriously flawed and totally lacking in supporting data.

The petitioner fails to define Spread Spectrum (SS) emission<sup>2</sup>. SS can be most generally defined as a transmission method where the occupied bandwidth exceeds the information bandwidth. Several presently authorized and commonly used transmission systems fall in this category. Most of these are analog techniques where the occupied bandwidth is only somewhat larger than the information bandwidth. These analog systems are specifically defined within the rules by emission type and require no further discussion.

One of the most common misconceptions about SS emissions is that they must occupy huge bandwidths. Spreading a Morse Code transmission with an information rate of 150 Hz over 15 kHz most certainly produces a classic Spread Spectrum signal and can easily be demodulated with the processing gain enhancement touted by the SS community. A conventional voice transmission can have a (digitally sampled) information rate as low as 8 kHz. Spreading this information over 150kHz<sup>3</sup> will again produce a classic SS signal. Both of these examples can be done by analog methods, but are far more easily managed to obtain useful process gain when the spreading methods are digital. These are examples of some types of SS emissions which are likely to occur regularly given the expanded SS usage the petitioner envisions.

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<sup>2</sup> The FCC Rules do define SS emissions. The applicable sections of part 97 do not provide an adequate basis for this petition. The petitioner should have provided the definition as part of the basis for the petition.

<sup>3</sup> 150 kHz is used as an example because it matches the IF bandwidth of most commercial broadcast FM receivers. These receiver IFs could very easily and inexpensively utilized to receive the SS transmission described.

The power density of SS emissions can be quite high. A 100 W SS transmitter occupying 150 kHz has a power density of 0.67 W/kHz. A conventional narrowband FM repeater receiver commonly has a 15 kHz bandwidth. This SS transmitter would have 10 watts of its power within the passband of the repeater receiver.

The petitioner claims several benefits occur from the use of SS transmissions.<sup>4</sup> The statements are formulated to imply that the listed benefits occur simultaneously. Nothing could be farther from the truth. The petitioner left out several key qualifiers in each of the listed benefits. The petition is devoid of technical fact, measurement or fully formulated premise. The following statements should clarify the petitioners' claims and the defects in each:

SS emissions have “reduced power density...” This phrase is only true when comparing identical information bandwidths and identical total transmitted power; one spread and one not spread. An SS transmission occupying 15 kHz has exactly the SAME (average) power density as any other (identically powered) emission occupying 15 kHz. A 10 W analog Amateur television transmission which is 6 MHz wide has exactly the same average power density as (for example) a 10 W SS emission generated by spreading a 1.544MB “T1” data stream over 6 MHz.

“...concomitant reduction in interference to narrowband systems.” The presumptions here are that the undesired SS signal will occupy much greater bandwidth than the desired “narrowband” signal, and produce less undesired signal in the narrowband receiver. The signal produced in any receiver by any transmitter, desired or undesired, cannot be determined without technical facts. The transmitter powers, antenna gains, transmit and receive bandwidths, and path losses MUST be known before any such statement can be made. We give examples above where the SS bandwidths can easily be the same or less than those of a conventional transmission to which the SS signal is claimed to produce a reduction in

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<sup>4</sup> Instant Petition at 2

interference. The SS signal WILL produce similar interference to that generated by any other emission of the same bandwidth.

“Significant improvements in communications under .... interference conditions.” This is simply not true. Far too many special conditions must be presumed for an SS signal to deliver better communications than a similar analog system under the same conditions. Here again, no technical specifications or examples are given. The most significant conditions are: The SS system must either be a “hopping” type in order to “skip” over an interfering carrier, or the sum of the interfering carriers must not be greater than the SS signal by the ratio of the process gain. The SS transmission also can not share spectrum with too many other similar SS systems or undesired carriers lest it “run out” of places to “skip”. The SS system is also presumed by the petitioner to be a digital transmission where forward error correction can be used and propagation delay can be tolerated in order to re-send a missed “packet.”

“Improved ... performance in selective fading and multipath environment”. This can actually be true with two important assumptions: That substantial digital forward error correction be employed, and that a lost data packet can be re-transmitted. Field experience with digital microwave systems actually demonstrate that they are more susceptible to path problems than an identical analog system. With sufficient forward error correction and even more bandwidth (to increase the process gain) this can be overcome.

“SS can .... accommodate more “channels” in the same spectrum than a FDMA system ...” This statement is far too broad. It is fact that a digitally processed SS system utilizing “exclusive” spectrum can accommodate more traffic in the same bandwidth than can a FDMA system. This is mostly a result of the digital processing to compress (in time) the communications and the use of all the available spectrum space without having to leave “guardbands” between each channel assignment. It is also dependent upon the communications user being willing to tolerate propagation delays which will increase as the system traffic increases.

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The petitioner states that “SS.. is well suited to the amateur service, especially in shared bands.”<sup>5</sup> The petitioner also states an “apparent compatibility” between SS and “narrowband” modes. The Petitioner supplies NO supporting evidence for this far reaching broad statement. The citation of “no one reported any interference, so there must not be any”, and “tests conducted by amateur groups”, is absolutely unacceptable. Stating something simply does not make it so. There MUST be facts determined in an organized scientific manner. These data, together with a description of the methods by which these data were determined and analysis of the these data MUST be published or otherwise be made widely available to the amateur community and others in order to lend any credence to the petitioners' statements. As stated, they must be dismissed out of hand as suppositions and opinions, things which have no place in formal proceedings. We submit that most of the statements made in this section of the Petition are simply wishful thinking and are NOT facts.

We must also point out the circular reasoning in this same paragraph. The paragraph begins with the above quoted statements and continues: “SS .. can, due to increased in-band noise, trigger carrier squelch activated repeaters.” This statement means there actually IS interference to narrowband systems by SS transmissions. This makes SS “well suited” to the Amateur Service? A discussion of the audible form this interference takes is simply a waste of time. Methods of hiding the interference may make such interference less obvious, but in NO way diminishes the actual interference. Sufficient signal received by a repeater receiver to “trigger” the repeater is often exactly the minimum amount necessary to communicate through the repeater. Adding “CTCSS” to a repeater receiver to eliminate the “triggering” does NOT reduce in any way the interference received from SS transmissions. Utilization of SS parameters chosen to avoid the SS transmission “landing” on the repeater receive frequency is impractical in any crowded environment. This is because there is a repeater receiver on practically every possible frequency and the SS transmission would have so few frequencies left to use as to render the SS benefit virtually nil.

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<sup>5</sup> Instant petition at 5 (section II, #4)

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Most repeater owners make significant efforts to make their system work as well as possible. Today, there are at least as many Amateur hand held radios as there are mobile radios. The signal produced by a hand held at the repeater receiver is often enough quite close to the system threshold. Repeater owners strive to “quiet” that signal through a number of enhancement techniques. Adding any interference is often enough to render the repeater inaccessible to the hand held radio. A hand held radio is quite often the Amateurs equipment of choice in an emergency situation. Diminishing the performance of a repeater with SS interference will be quite likely to render some emergency communications impossible.

The petitioner quotes a report by STA holder Mr. Buaas, K6KGS<sup>6</sup>. Nowhere in the quoted sections or the remainder of the report are there any reported data, operating parameters, technical analysis of measurements made, or the methods used to obtain those (apparently non-existent) measurements. The report is entirely without supporting facts, and so must be dismissed as inadequate and incomplete. The report appears to actually have been intended as an interim statement of progress in testing and a request for an extension of the STA (which the commission apparently granted). Even as an interim report, this document is totally lacking in supporting data. Mr. Buaas may have actually made measurements and actually have developed some trial methods of spectrum sharing with “narrowband emitters”, but without DATA to support his statements, we will never know.

The petitioner and Mr. Buaas claim<sup>7</sup> that the existing Rules governing Amateur SS emissions are excessively restrictive, but neither party states HOW the rules are restrictive. SCRRBA does not believe that SS experimenters should be given a “free hand” to do whatever they want without some specific explanation of what they intend and some specific DATA on what they have done to date.

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<sup>6</sup> Petition at 9, 10, 11. Letter in question is one page long and addressed to Mr. Haller, and dated March 31, 1993

<sup>7</sup> Petition at 12, Buaas letter at 4



**Analysis of proposed rule changes:**

<sup>8</sup>97.305(b) add “or SS” to test transmissions. This seems unnecessary, but does not propose any actual change. SS emissions are a listed emission type and as such are already an “allowed” emission subject to the rules.

<sup>9</sup>97.311(a) Proposed change is to allow international communications using SS emissions. This proposal is premature as the Petitioner has not made a technical case for the rest of the petition.

<sup>10</sup>97.311(b) The proposal is to delete the last sentence of the section. The Petitioner misses the point here as well. Lack of meaningful data has caused another erroneous conclusion. The presence of sufficient signal from an SS transmission to “trigger” the repeater demonstrates that the repeaters noise floor has increased, thereby reducing its ability to hear a weak signal. We show at paragraph xx, supra, that hand held radio transmissions are the most likely to be used in an emergency, and are the most susceptible to interference.

Removing the protection provided to other authorized emissions requires replacing that protection with a meaningful substitute. We propose that this section be amended in its entirety rather than partially:

97.311(b): Stations transmitting SS emissions must not cause harmful interference to stations employing other authorized emissions, and must accept all interference caused by stations employing other authorized emissions, unless the SS station is utilizing a frequency and bandwidth recommended by a local frequency coordinator, in which case the two station licensees are equally and fully responsible for resolving the interference. ~~For the purpose of this paragraph, unintended triggering of carrier-operated repeaters is not considered to be harmful interference.~~

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<sup>8</sup> Petition at 13, Section III, Proposed Rule Changes, labeled 7, and appendix

<sup>9</sup> Petition at 14, Section III, labeled 8, and appendix

<sup>10</sup> Petition at 15, Section III, labeled 9, and appendix

<sup>11</sup>97.311(C)&(d). The proposal to delete these sections is out of order. The petitioner has totally failed to support its petition in any substantive way. However reasonable this request may seem, it needs to be analyzed carefully and a decision be based upon facts, preferably data supplied by the petitioner. Absent such data, deleting restrictions based just upon the statement that “present rules are not optimal for sharing”<sup>12</sup> cannot be supported.

<sup>13</sup>97.311(G) The petitioner proposes to saddle Amateur SS operations with an artificial method of controlling power. This concept is foreign to the Amateur rules, but, appears to be a reasonable concept, with one serious flaw in its reasoning. The presumption that controlling the power of an SS emission automatically (or any other way, for that matter) will significantly minimize interference is flawed. In most cases in the Southern California region, a transmission from almost any point in the region is easily receivable at most of the elevated locations where conventional relay stations are located. If the signal produced by an SS transmitter running 100 watts arrives at these receivers at an audible level, reducing the power by 10 or even 20 dB will only change the magnitude of the interference, not eliminate it. From most locations on the valley floor the path loss to some of these elevated locations is low enough where signal generator power levels (10-50 milliwatts) are quite audible. We visualize a normal state where two SS stations are sending data to each other across the valley floor. This example condition might have normal propagation path losses so that 1 watt is sufficient. When the typical weather inversion sets in, the path loss will vary from where 10 milliwatts might be sufficient (a rarity) to where 100 W is less than sufficient (more often the rule than the exception). It must be noted that this method of controlling power implies that the SS transmitter will run maximum power during the time necessary to establish communications and evaluate the digital performance of the path (not its signal strength).

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<sup>11</sup> Petition at 16, Section III, labeled 10, and appendix

<sup>12</sup> The statements by the petitioner and Mr. Buaas are actually asking for the freedom to use whatever scheme they can think of without being subject to any regulatory restrictions or guidelines. In light of their total lack of technical support for their position, we cannot support this change.

<sup>13</sup> Petition at 17, labeled 11, and appendix

## SCRRBA

There are two items which must be added to the proposed rules as a result of this proposal:

One: Add to section 97.119(b)(5) That any SS transmitter whose power is automatically controlled must give its identification on the specified frequency at its maximum power to facilitate identification. Two: That the output power of an SS station be measured by the peak power method. The proposed section 97.311(g) would then read, in part:

97.311(g) The transmitter output power must not exceed 100 Watts PEP under any conditions. If more than one Watt PEP is used, automatic transmitter power control shall limit the peak output power to that which is required to maintain the communication. (Section continues as proposed).

Section 97.119(b)(5) would then also be modified as follows:

97.119(b)(5) By a CW or phone emission during the SS transmission on a narrow bandwidth frequency which is either one recommended by the local amateur frequency coordinator, or, absent such a coordinator, is in conformance with the established amateur band utilization plan for the local area. If the SS transmitter utilizes automatic power control, the identification shall be transmitted at the maximum power the transmitter is normally capable of generating. ~~Alternatively, by changing one or more of the parameters of the emission so that a conventional CW or phone emission receiver can be used to determine the station call sign.~~

## SCRRBA

### Conclusions:

The most serious flaw in the proposed rule changes is the attempt to place SS emissions “above” the emissions of other amateurs who are already operating within the same spectrum. This CANNOT be allowed to occur. Amateurs operating with SS emissions must have no more and no less privilege to operate than Amateurs operating with any other emissions. The Amateur community has a long history of recognizing this equal privilege. Amateur band planning and frequency coordination efforts around the nation attest to this fact.

SCRRBA is not opposed to Amateur SS emissions. We support the development of new and improved technologies. We support the development of more effective spectrum utilization methods. We do not and can not support any new uses or methods which jeopardize existing uses. Incumbent upon this position is the requirement for Amateur band planning efforts to be sufficiently forward minded to work out ways for new methods and uses to be accommodated.

The ARRL “jumped the gun” in this area, albeit incompletely. The band utilization structure, a band plan, is generated at the local level as described above. It is NOT generated at the national level, petitioned into the regulations and THEN handed to the local regions of the country.

SCRRBA submits that this petition is defective and incomplete and should be summarily dismissed. We have provided discussion and information on several areas inadequately or incorrectly covered by the petition. Should the Commission choose to act on this petition, we have provided suggestions for corrections to the proposed rule changes to make them more complete and accurate.

Respectfully submitted

For the SCRRBA Board and Technical Committee



M. Robin Critchell Board Member